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EXAMINER	
JOHNSTON, PHILLIP A	
ART UNIT	**PAPER NUMBER**
2881	

DATE MAILED: 11/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/078,056	MOLLOV, IVAN P.	
	Examiner	Art Unit	
	Phillip A Johnston	2881	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a) In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b)

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-50 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-50 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 15 February 2002 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

Detailed Action

Claims Rejection – 35 U.S.C. 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which the subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-50 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,825,032 to Nonaka, in view of Perez-Mendez, U.S. Patent No. 5,548,123 and in further view of Polischuk, U.S. Patent No. 6,171,643, and in still further view of Suzuki U.S. Patent Pub. No. 2003/0015665.

Regarding Claims 1-10,21,32,37, and 44 Nonaka (032) discloses a first solid-state radiation detection means 24 comprising a first scintillator 22 and a first solid-state light detection means 23, and a second solid-state radiation detection means 27 comprising a second solid-state light detection means 25 and a second scintillator 26 are arranged in front of a radiation generation means 21. The solid-state radiation detection means 24 and 27 comprise

combinations of the scintillators 22 and 26 which absorb radiation and emit visible light corresponding to the absorbed energy, and the solid-state light detection means 23 and 25 each of which comprises a two-dimensional matrix of photoelectric conversion elements that convert the visible light into an electrical signal corresponding to the intensity of the light. The outputs from the first and second solid-state radiation detection means 24 and 27 are connected to an image information combining means 28, and an object S to be examined is located on the front surface of the second scintillator 22. Furthermore, as shown in FIG. 8, a light-shielding layer 29 which transmits radiation but does not transmit light is arranged between the first and second solid-state radiation detection means 24 and 27.

Since the first solid-state radiation detection means 24 has a radiation quantum trapping efficiency less than 100%, a given proportion of the incident radiation is transmitted through the first solid-state light detection means 23. The transmitted radiation is similarly detected and accumulated by the second solid-state light detection means 25 and the second scintillator 26, which are arranged on the rear surface of the first solid-state light detection means 23 with respect to the radiation incidence route. See Column 6, line 30-50; Column 7, line 1-9; Figure's 7 and 8.

It is inherent in Nonaka (032) that x-rays traverse the energy detection layer 25 before propagating through the x-ray converting layer (scintillator 26).

Nonaka (032) as applied above does not disclose the use of photodiode layer, as recited in Claims 4, and 10. However, Perez-Mendez (123) discloses

Crystalline silicon photon detectors can be used as electronic X-ray detectors. However, X-ray detectors having a layer of scintillator material coupled to a p-i-n light detector are lower in cost, higher in efficiency, and have greater radiation hardness. In the p-i-n light detector in such X-ray detectors, a P-type layer, an N-type layer, and an intrinsic region between the P-type layer and the N-type layer are formed in a layer of hydrogenated amorphous silicon. At present, a two-dimensional amorphous silicon X-ray detector array covering the size of a conventional X-ray film (up to about 360 mm by 430 mm) is not feasible from the point of view of cost. To overcome this difficulty, the object is mechanically scanned using a linear (one-dimensional) electronic X-ray detector.

To scan the object, either the linear X-ray detector is moved linearly relative to the object, and the X-ray source is rotated to track the X-ray detector, or the X-ray source and the linear X-ray detector array are maintained in a fixed relationship to one another, and the object is moved linearly between them. With either scanning technique, the electrical outputs of all the X-ray detecting elements ("pixels") of the linear X-ray detector provide one line of a rasterized X-ray image. The electrical outputs of all the pixels of the linear X-ray detector for each line of the rasterized X-ray image are stored. When the scan is completed, the rasterized X-ray image is derived from the stored electrical outputs. See Column 1, line 36-62.

Perez-Mendez (123) also discloses that each of the X-ray detectors 212, 214, and 216 consists of a linear array of pixels, such as the pixel P, which are preferably about 50 microns square. The thickness of each X-ray detector in

the direction of the incident X-rays is about 300 microns. The length of each X-ray detector in the direction perpendicular to the direction of scanner motion D and the direction of the incident X-rays I depends on the application, but is normally in the range of 150-250 mm. Two or more sets of X-ray detectors can be arranged in tandem to provide lengths greater than the maximum of this range.

The X-ray detectors 212, 214 and 216 used in the second embodiment consist of the amorphous silicon light detectors 262, 264 and 266. The light detectors each have a major surface in which pixels, such as the pixels P, are formed. The X-ray detectors are oriented such that the surfaces in which the pixels are formed are generally perpendicular to the direction of the incident X-rays I. In the X-ray detectors 212, 214, and 216, the scintillator layers 272, 274, and 276, respectively are deposited on the surfaces in which the pixels are formed. The light detectors 262, 264, and 266 include a layer of amorphous silicon about one micron thick, and detectors respectively detect the photons of visible light respectively emitted by the scintillator layers 272, 274, and 276 in response to the incident X-rays.

Each of the scintillator layers converts X-ray photons into visible light photons by absorbing the X-ray photons. The scintillator layer 272 of the X-ray detector 212 therefore acts as the X-ray absorption element upstream of the X-ray detector 214, and the scintillator layer 272 of the X-ray detector 212 and the scintillator layer 274 of the X-ray detector 214 together act as the X-ray absorption element upstream of the X-ray detector 216. The scintillator layers

272 and 274 provide the required resolution of the incident X-rays into energy-dependent components without the need for the discrete X-ray absorbing elements 118 and 120 shown in FIG. 3. Each of the scintillator layers 272, 274, and 276 is preferably a layer of thallium-activated cesium iodide (as recited in Claim 16) with a thickness of about 300 microns. See Column 8, line 51-67; and Column 9, line 1-28.

Therefore it would have been obvious to one of ordinary skill in the art that Nonaka's (032) radiographic imaging apparatus and method can be modified to use photodiodes in accordance with Perez-Mendez (123), to reduce cost and improve efficency .

Regarding Claims 12-14,23-25,29,30,33-35, and 46-48, Nonaka (032) in view of Perez-Mendez (123) discloses nearly all the limitations of Claims 12-14,23-25,29,30,33-35, and 46-48 but does not disclose the use of CCD, CMOS and TFT layers. Polischuk (643); however, discloses in FIG. 1 a multilayered plate 10 which comprises a substrate 12 which, in this case, is shown to be a TFT (Claim 14) matrix (thin film transistor), and a biasing electrode 14 which is made of a high voltage biasing structure capable of withstanding voltages in excess of 500 volts. A selenium based multilayered membrane 16 is sandwiched between the substrate 12 and the biasing electrode 14. The substrate 12 can be any desired substrate, such as aluminum, glass, a thin film transistor array, a charged coupled device (CCD)(as recited in Claim 12) and a complementary metal oxide semiconductor device (CMOS)(as recited in Claim 13).

In accordance with the preferred embodiment of the present invention illustrated in FIG. 1, this membrane comprises an energy absorbing and converting layer 18 which is also called a photoconductive layer and which is made of doped amorphous selenium, as recited in Claim 24.

Therefore it would have been obvious to one of ordinary skill in the art that the radiographic imaging apparatus and method of Nonaka (032) in view of Perez-Mendez (123) can be modified to use the CCD, CMOS and TFT sensor layers in accordance with Polischuk (643), to provide an improved X-ray imaging multilayer membrane .

Regarding Claims 17,27,41, and 49, Nonaka (032) in view of Perez-Mendez (123) and in further view of Polischuk (123) discloses nearly all the limitations of Claims 17,27,41, and 49 but does not disclose the use of mirror layer disposed above the scintillator layer. Suzuki (665); however, discloses (1) a radiation image sensor 1 having a plurality of light receiving elements arranged one or two dimensionally, (2) scintillator 2 having columnar structure formed on the light-receiving surface of this image sensor 1 to convert radiation into light including wavelengths that can be detected by the image sensor 1, (3) a protective film 3 formed so as to cover and adhere to the columnar structure of the scintillator 2, and (4) a radiation-transmittable reflective plate 4 that has a reflective surface 42 disposed to face the image sensor across the protective film 3. See Figure 1, and Abstract.

Therefore it would have been obvious to one of ordinary skill in the art that the radiographic imaging apparatus and method of Nonaka (032) in view of

Perez-Mendez (123), and in further view of Polischuk (123) can be modified to use the mirror layer of Suzuki (665) so that efficient, high-sensitivity measurement can be performed.

Conclusion

3. Any inquiry concerning this communication or earlier communications should be directed to Phillip Johnston whose telephone number is (703) 305-7022. The examiner can normally be reached on Monday-Friday from 7:30 am to 4:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiners supervisor John Lee can be reached at (703) 308-4116. The fax phone numbers are (703) 872-9318 for regular response activity, and (703) 872-9319 for after-final responses. In addition the customer service fax number is (703) 872- 9317.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703 308 0956.

PJ

October 29, 2003

JOHN R. LEE
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800